

FIG. 1A

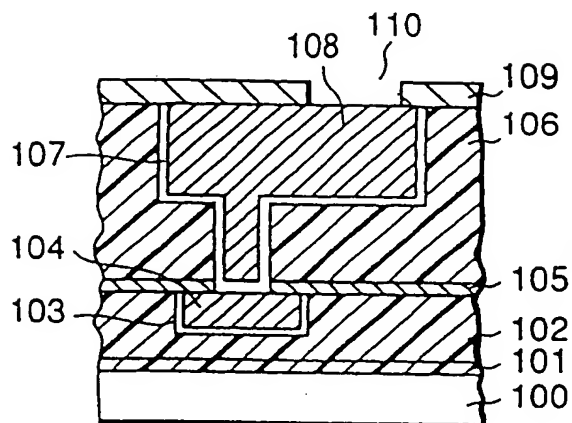


FIG. 1D

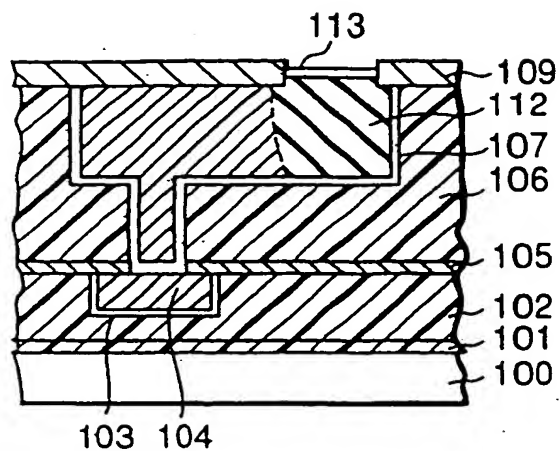


FIG. 1B

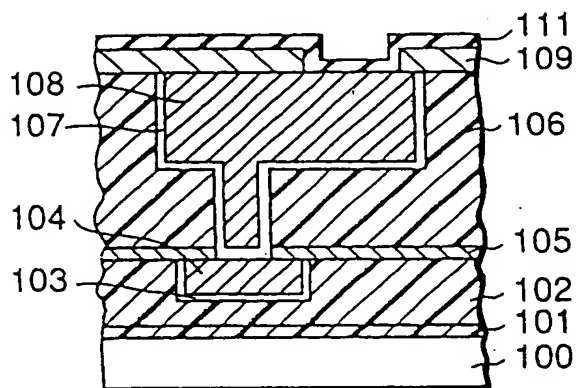


FIG. 1E

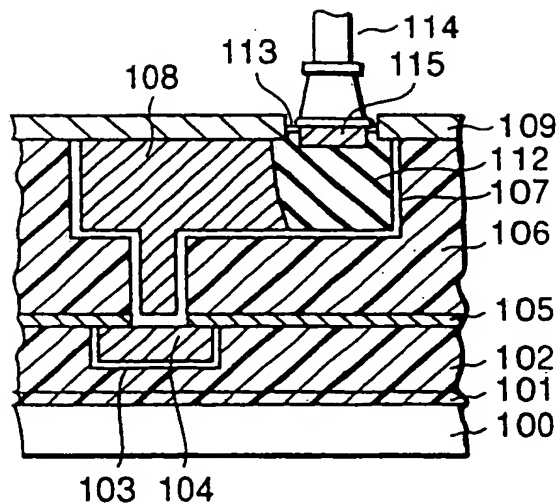


FIG. 1C

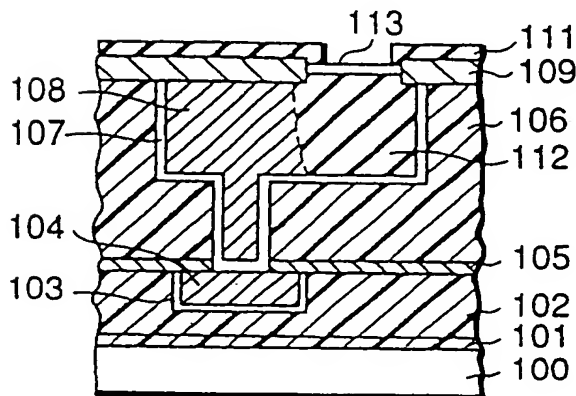


FIG. 2

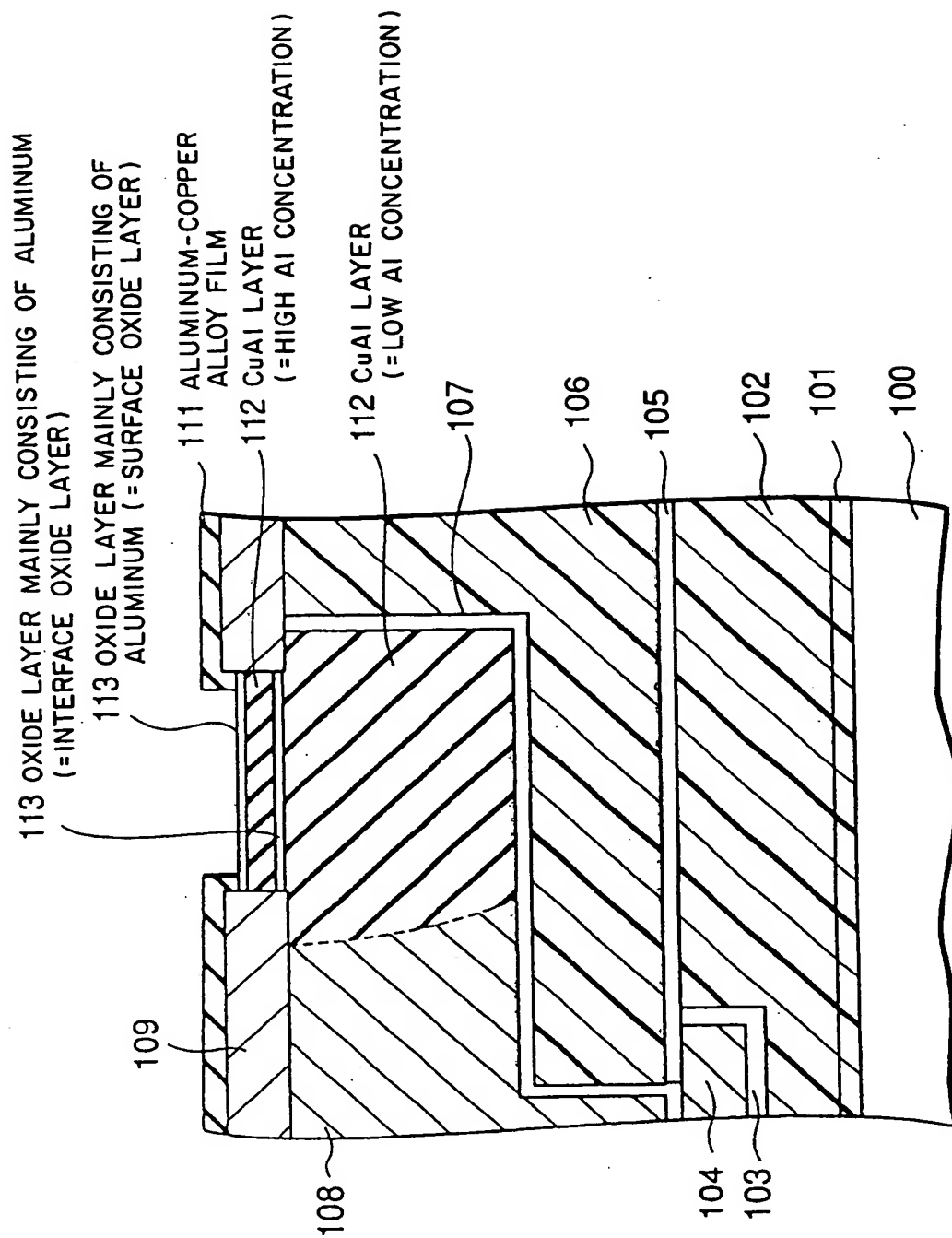


FIG. 3

Al CONCENTRATION IN SURFACE LAYER OF CuAl LAYER AND BONDING PROPERTIES

Al CONCENTRATION IN SURFACE LAYER	0.5%	1%	1.5%	2%	2.5%	3%	4%
BONDING PROPERTIES	x	x	Δ	○	○	○	○

FIG. 4A

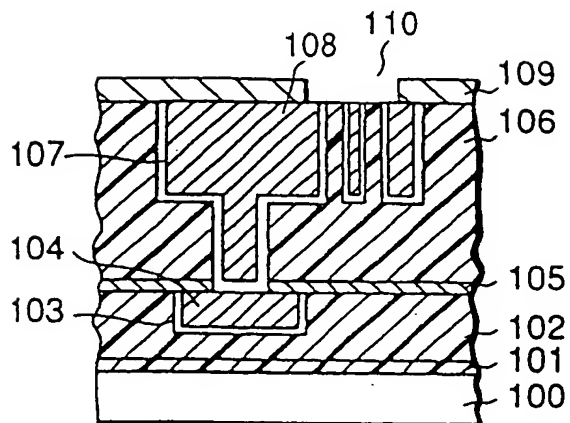


FIG. 4D

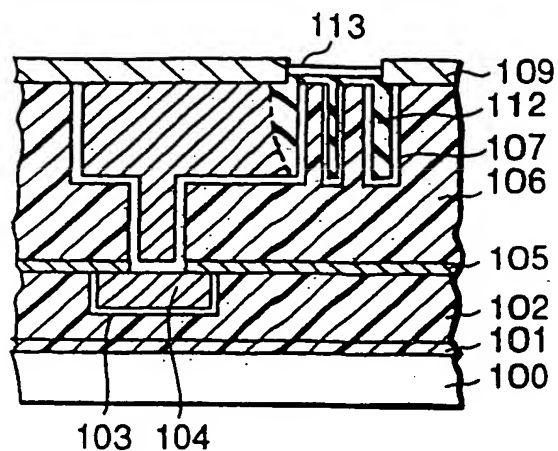


FIG. 4B

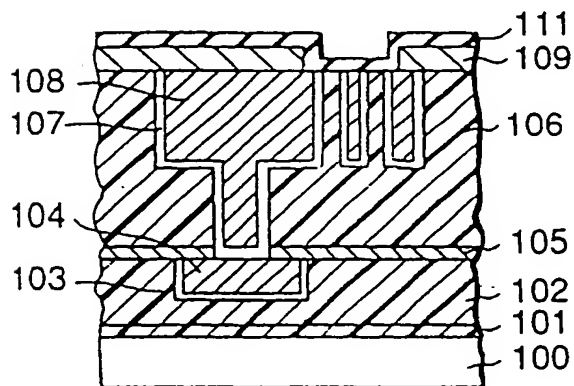


FIG. 4E

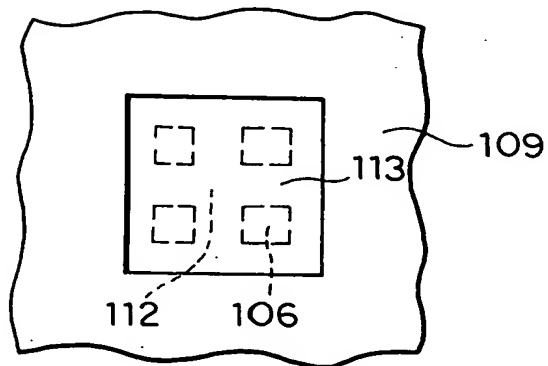


FIG. 4C

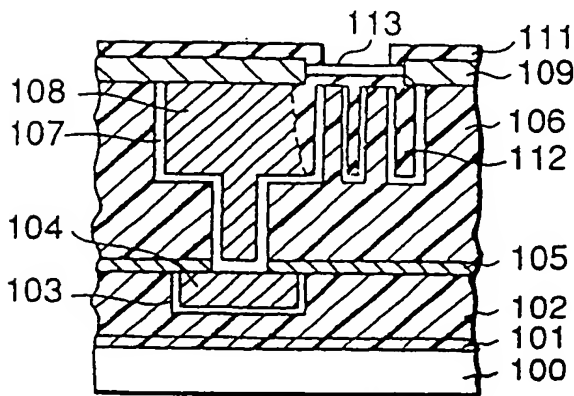


FIG. 5A

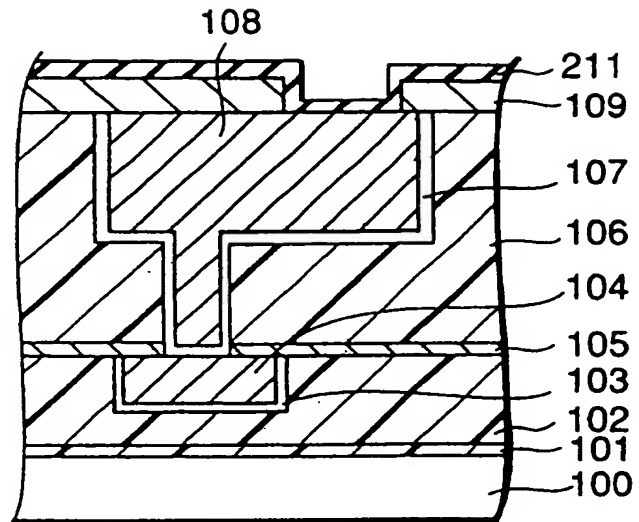


FIG. 5B

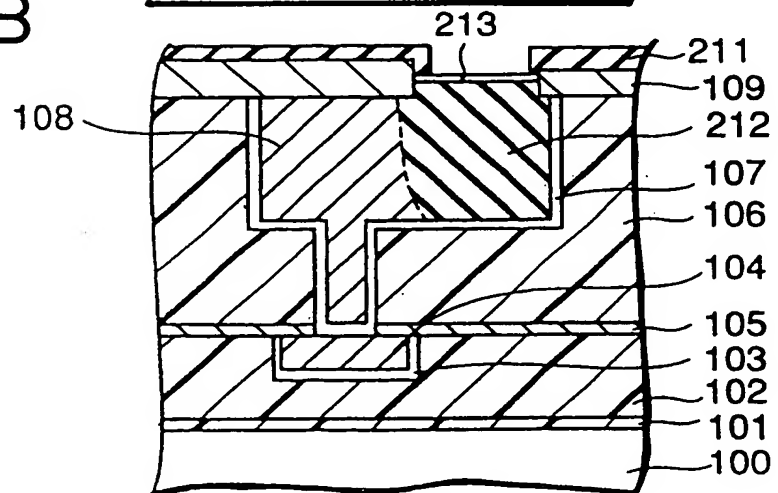


FIG. 5C

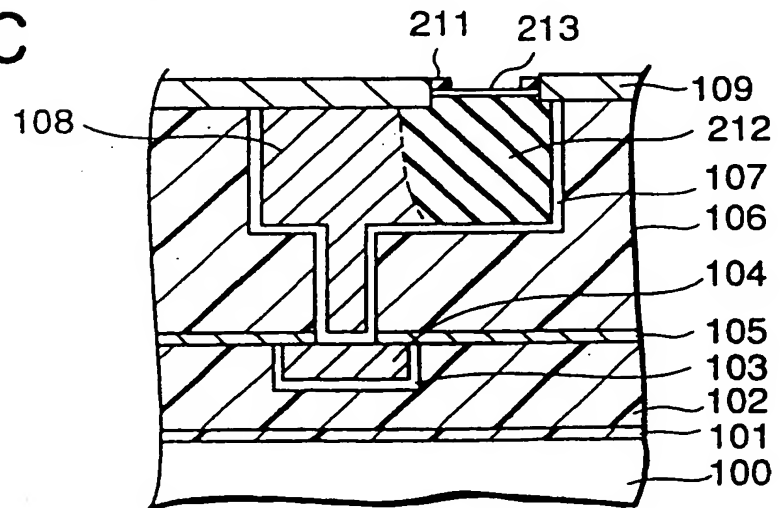


FIG. 6A

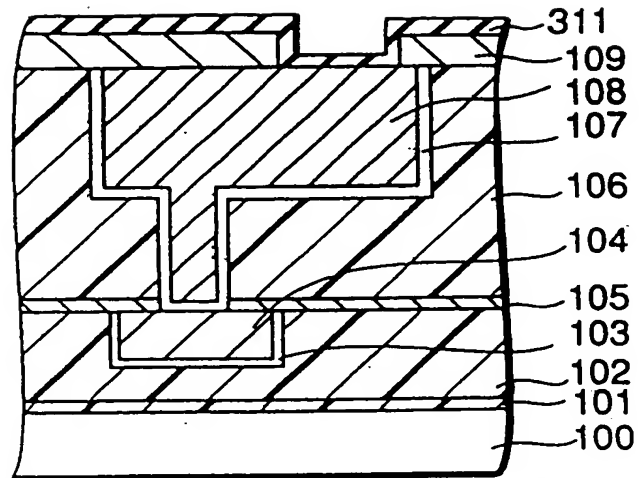


FIG. 6B

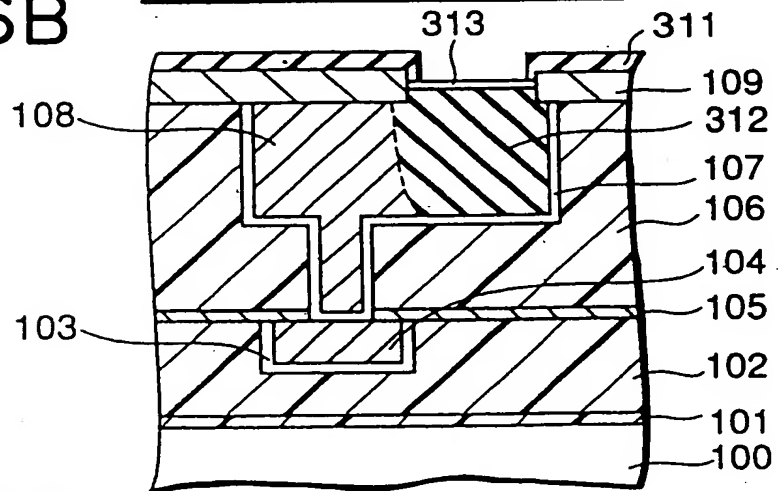


FIG. 6C

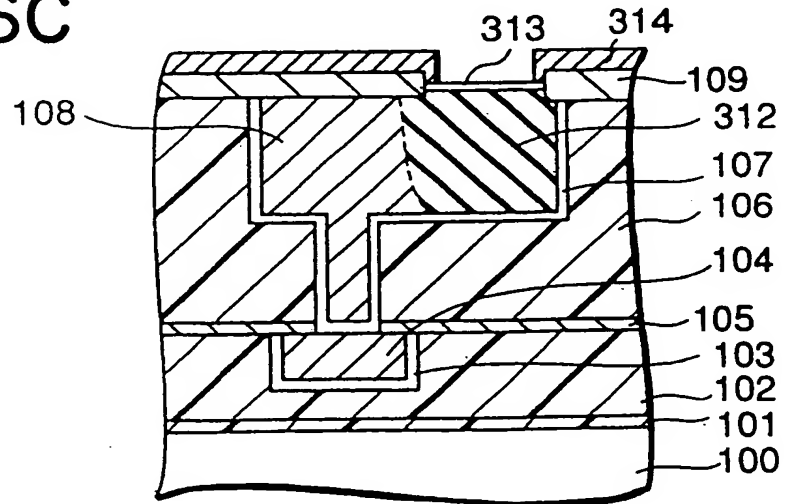


FIG. 7A

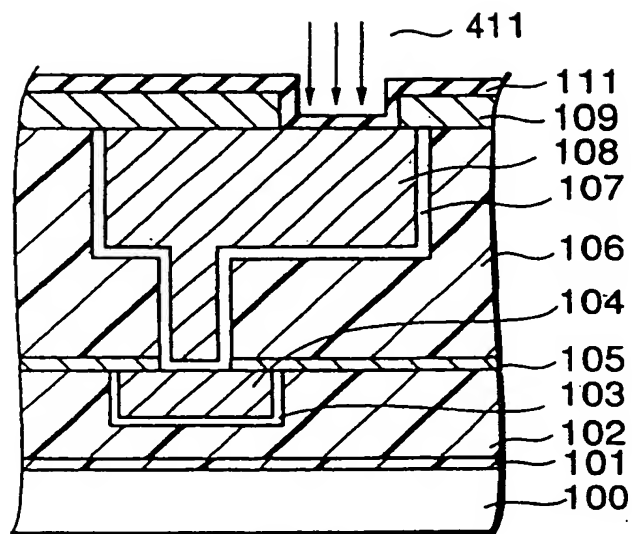


FIG. 7B

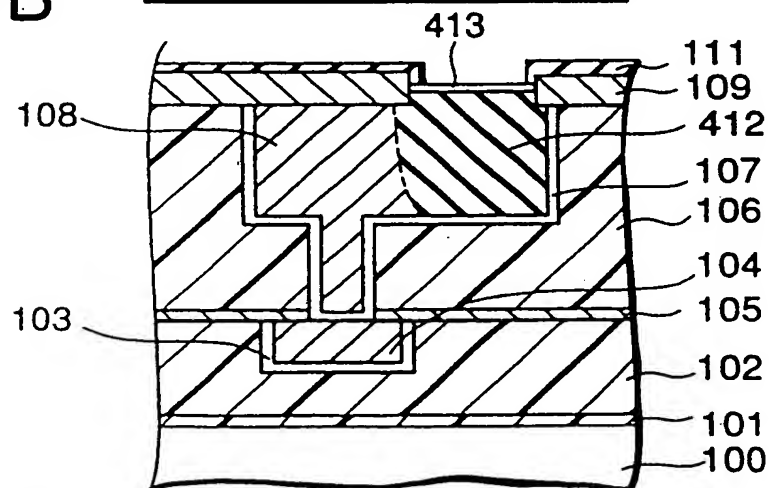


FIG. 7C

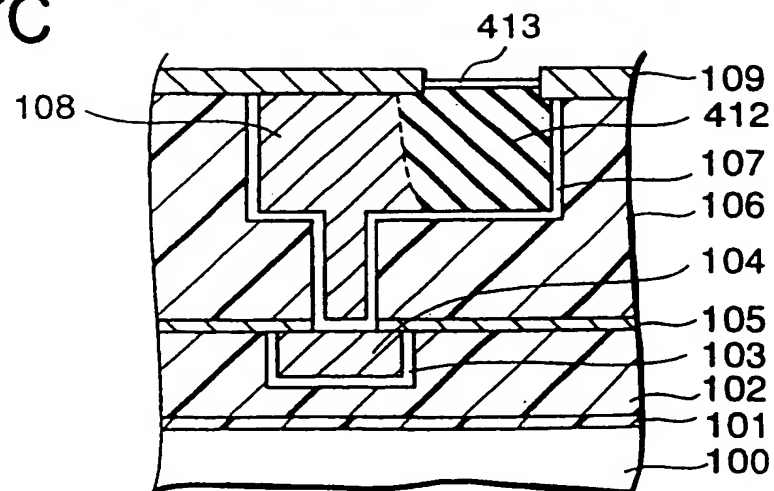


FIG. 8A

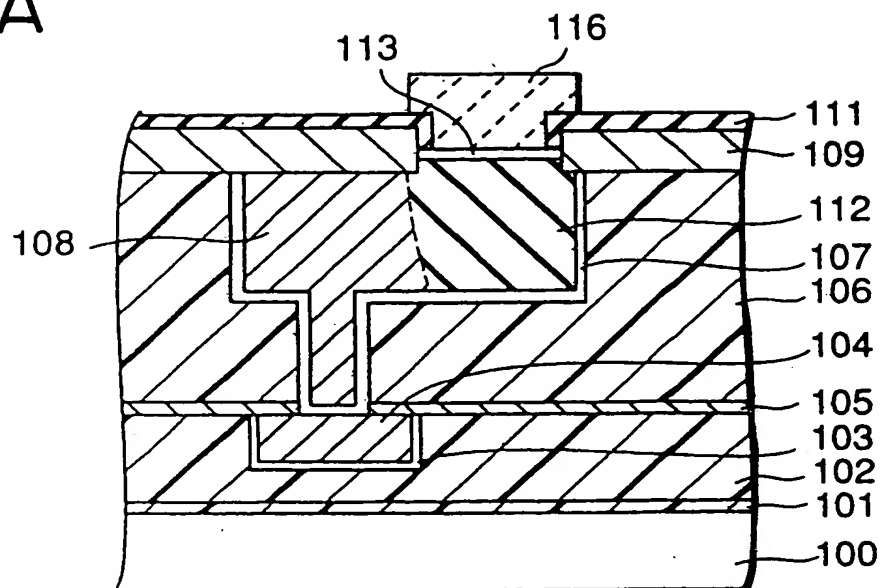


FIG. 8B

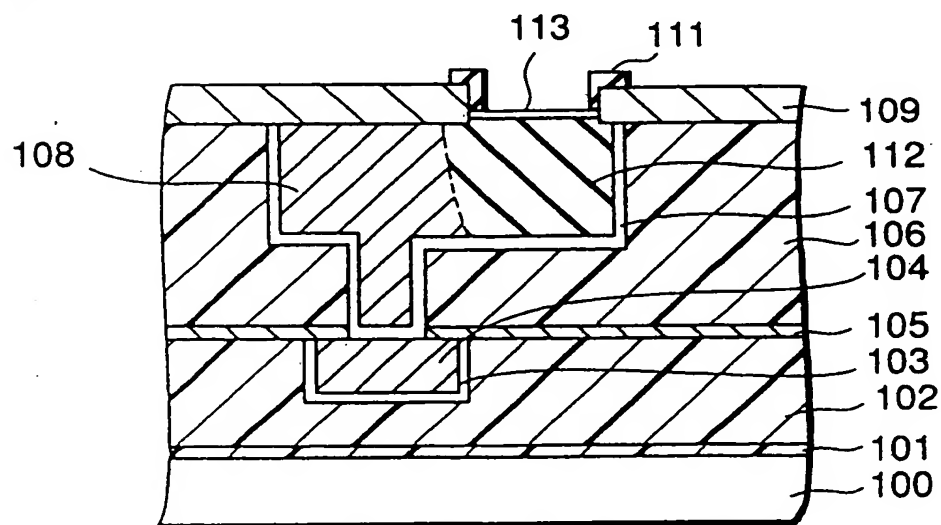


FIG. 9A

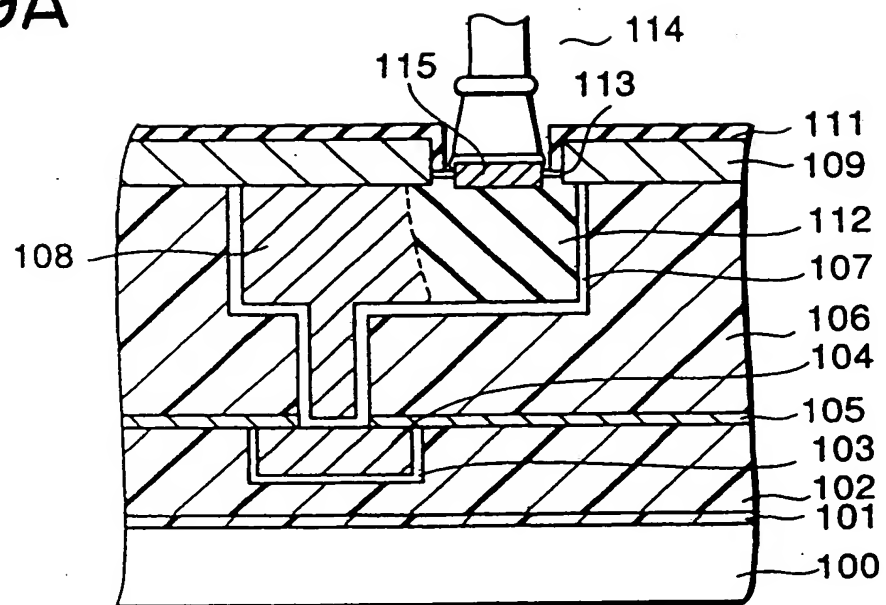


FIG. 9B

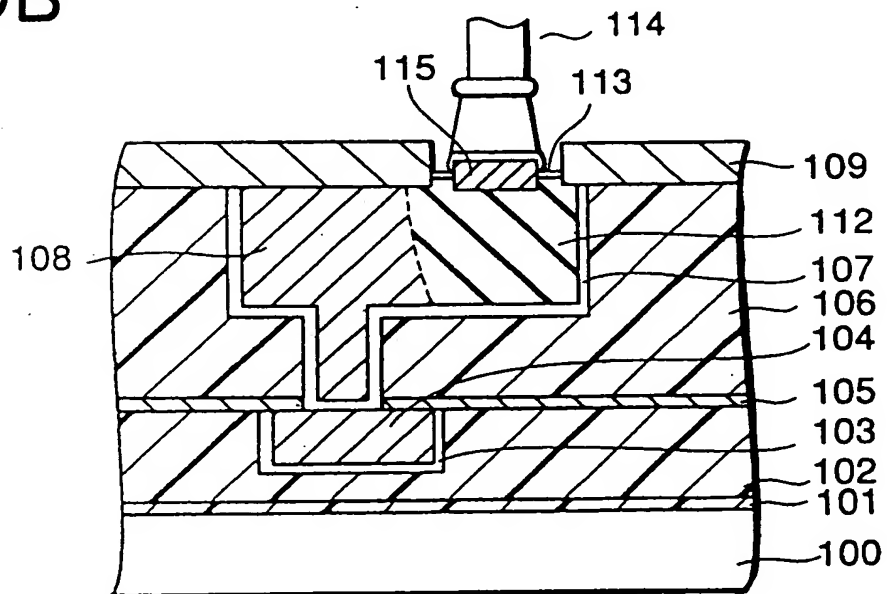


FIG. 10

SHEAR TEST

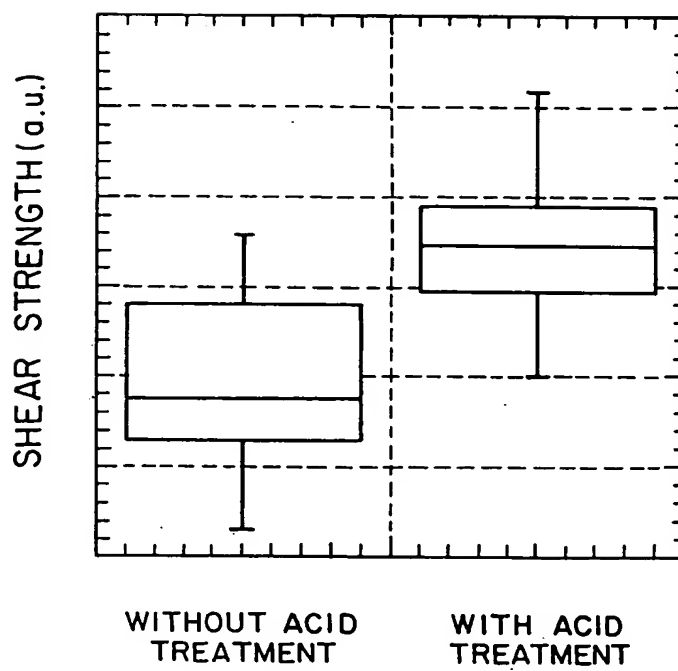


FIG. 1IA

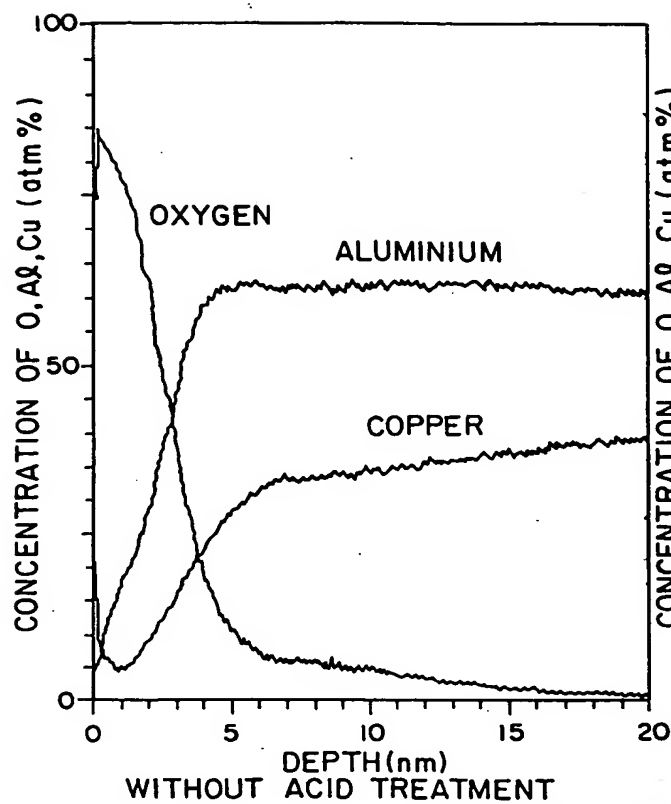


FIG. 1IB

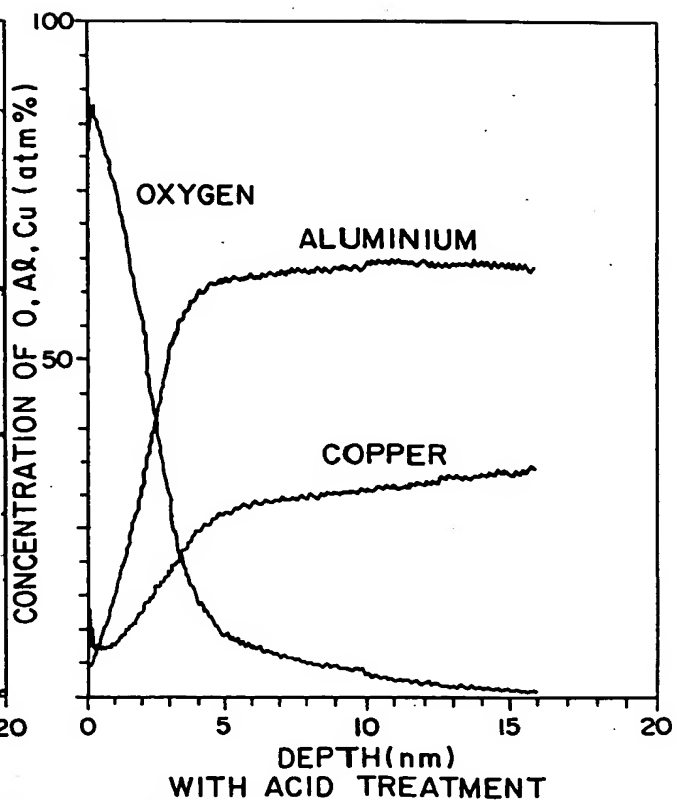


FIG. 1IC

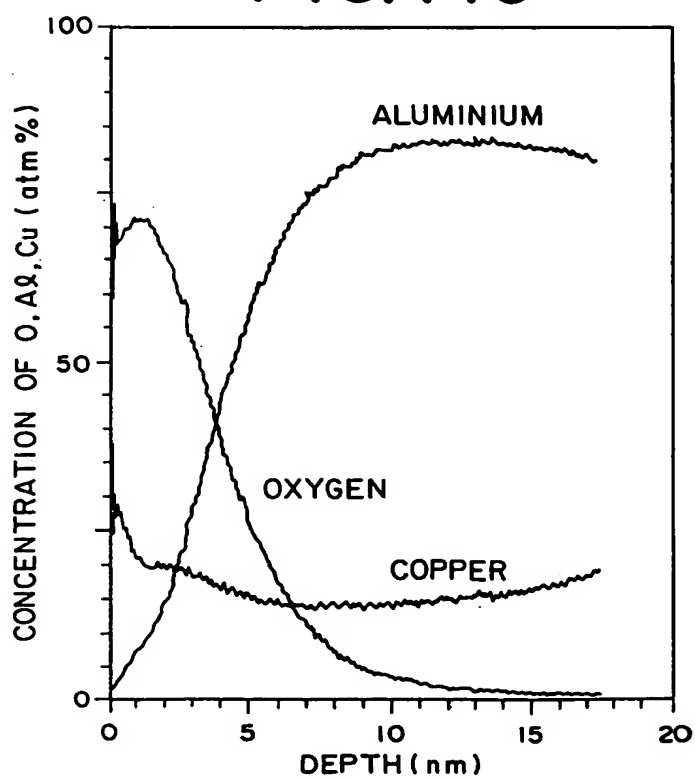


FIG. 12

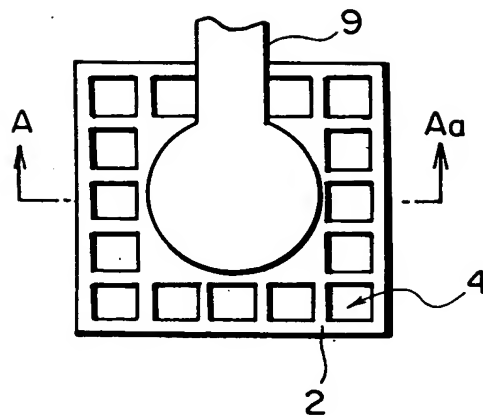


FIG. 13

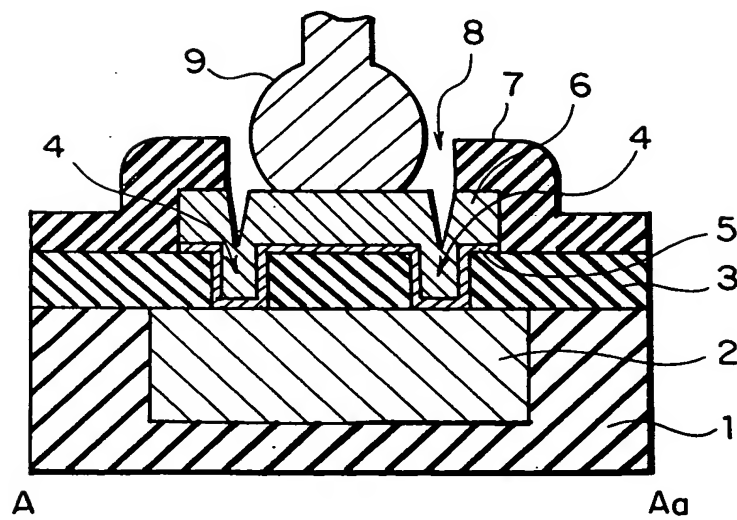


FIG. 14

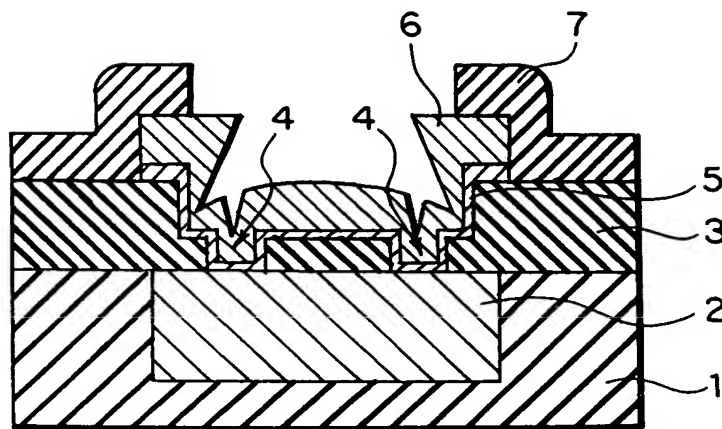


FIG. 15

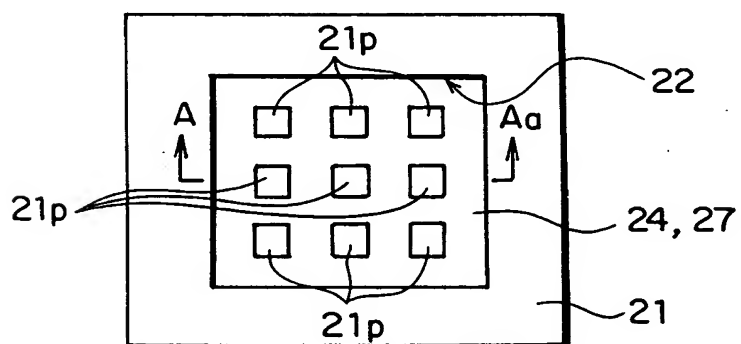


FIG. 16

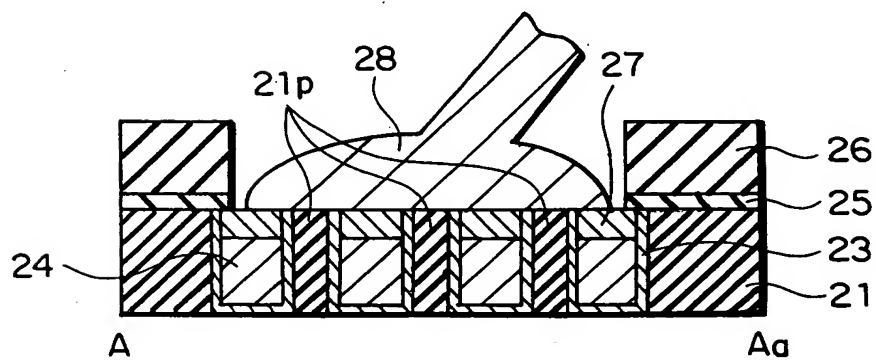


FIG. 17A

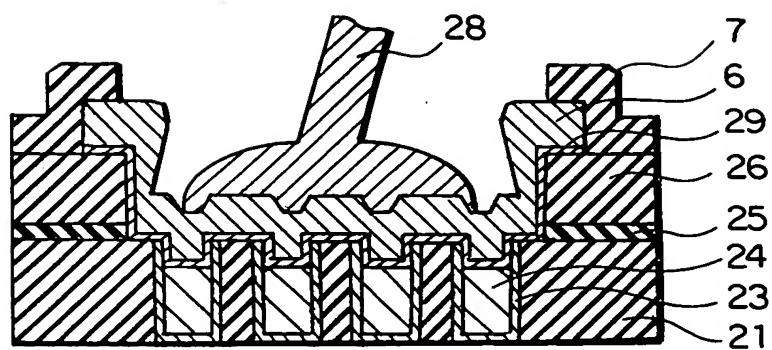


FIG. 17B

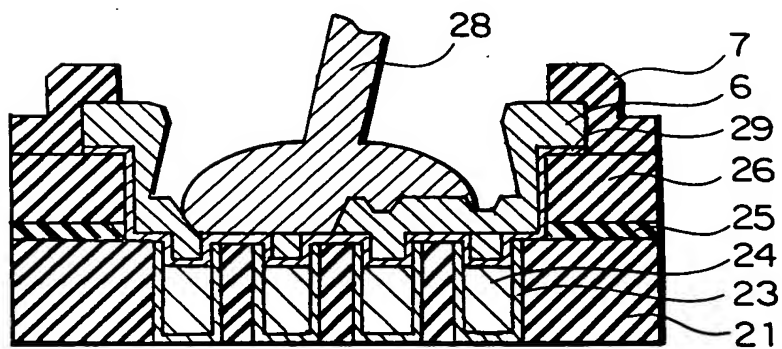


FIG. 18A

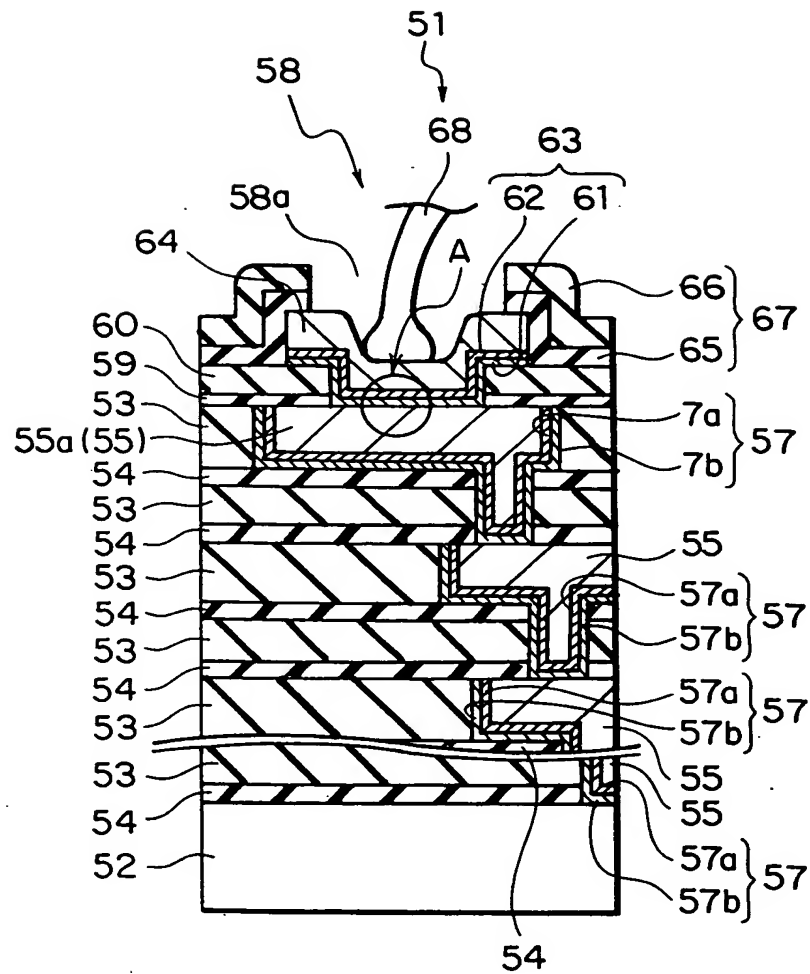


FIG. 18B

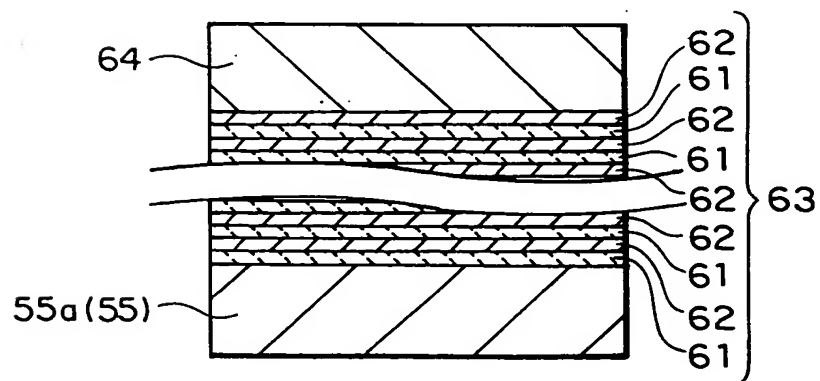


FIG. 20

Ta ₂ N FILM THICKNESS(nm)	60	3	5	10	30	60
Ta FILM THICKNESS(nm)	10	3	5	10	30	60
LAMINATION CYCLE(TIMES)	1	1	1	1	1	1
Cu/Al BARRIER PROPERTIES	O	x	x	x	x	O
POST-BONDING BARRIER PROPERTIES	x	x	x	x	x	x
POST-BONDING ADHESION PROPERTIES	x	x	x	x	x	x
DUST	O	O	O	O	O	O

FIG. 21

Ta ₂ N FILM THICKNESS(nm)	3	5	10	30	60
Ta FILM THICKNESS(nm)	3	5	10	30	60
LAMINATION CYCLE(TIMES)	2	2	2	2	2
Cu/Al BARRIER PROPERTIES	x	O	O	O	O
POST-BONDING BARRIER PROPERTIES	x	O	O	O	O
POST-BONDING ADHESION PROPERTIES	x	O	O	O	O
DUST	O	O	O	O	x

FIG. 22

Ta ₂ N FILM THICKNESS(nm)	3	5	10	30	60
Ta FILM THICKNESS(nm)	3	5	10	30	60
LAMINATION CYCLE(TIMES)	3	3	3	3	3
Cu/Al BARRIER PROPERTIES	x	O	O	O	O
POST-BONDING BARRIER PROPERTIES	x	O	O	O	O
POST-BONDING ADHESION PROPERTIES	x	O	O	O	O
DUST	O	O	O	O	x

FIG. 23

Ta ₂ N FILM THICKNESS(nm)	3	5	10	30	60
Ta FILM THICKNESS(nm)	3	5	10	30	60
LAMINATION CYCLE(TIMES)	6	6	6	6	6
Cu/Al BARRIER PROPERTIES	x	O	O	O	O
POST-BONDING BARRIER PROPERTIES	x	O	O	O	O
POST-BONDING ADHESION PROPERTIES	x	O	O	O	x
DUST	O	O	O	O	x

FIG. 24

Ta ₂ N FILM THICKNESS(nm)	3	5	10	30	60
Ta FILM THICKNESS(nm)	3	5	10	30	60
LAMINATION CYCLE(TIMES)	7	7	7	7	7
Cu/Al BARRIER PROPERTIES	x	O	O	O	O
POST-BONDING BARRIER PROPERTIES	x	O	O	O	O
POST-BONDING ADHESION PROPERTIES	x	O	O	x	x
DUST	O	O	O	x	x

FIG. 25
PRIOR ART

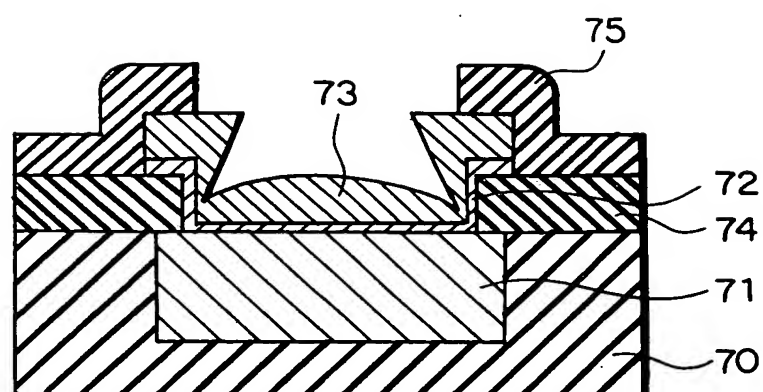


FIG. 26
PRIOR ART

